

is, about the beginning of the sixteenth century. Stamped bricks of this kind and age are rare, but some few specimens have been collected in London and Gravesend.

Mr. W. P. Griffith read an Essay on the different kinds of Stone employed in the erection and architectural embellishment of the public and private edifices of Babylon, Egypt, Greece, Rome, and Great Britain; accompanied by an account of a few of the principal building stones, including the derivation of their names, specific gravities, uses, durability, the several varieties of each stone, the buildings in which they have been employed, &c.

Mr. Thomas Wilmshurst will deliver a lecture "On Painting and Staining Glass" on Tuesday, March 10th.

#### INSTITUTION OF CIVIL ENGINEERS.

Feb. 10th, 1846.—Sir John Rennie, president, in the chair.

The discussion upon Mr. Barlow's paper "On the existence (practically) of a line of equal horizontal thrust in arches," which was read at the last meeting, February 3rd, was resumed, and was continued to such a length as to preclude the reading of any papers. It was contended, that the theoretical propositions of Professor Moseley, in his work on engineering and architecture, although very beautiful, were unfortunately so abstruse as to be comparatively useless to the practical man. Mr. Barlow's object had been, on the contrary, to produce what might be termed an empirical rule, by which a line or curve of pressure could be laid down on the profile of an intended arch, by which it would be ascertained whether the structure contained the elements of stability, or whether, due allowance being made for the known qualities of certain materials, the arch would resist perfectly, the pressure or load to be imposed upon it under all circumstances. It was evident that it must do this if the line of pressure, or the line of equal thrust, being traced, fell at each joint in such positions within the voussoirs, as suited their form, dimensions, and quality of material. If the line passed at such points between the intrados and the extrados, as brought the surfaces of the voussoirs well into contact at full bearing, the figure described was practically correct, but if the line fell without either the intrados or the extrados, or in practice so near them as that the material should be unequal to support the insistent pressure, the voussoirs would either be crushed or would turn over on the points where the line fell; this had been previously insisted upon and demonstrated, by a model of a segmental arch; of which the surfaces of the voussoirs were curved. The arch assumed various forms, resulting from the mode of applying pressure, and the spot where it was applied; but in all cases the curve of pressure was shown to be traced by the points of contact of the curved surfaces of the voussoirs. This arch stood well, and on the pressure being removed, always returned to its original form, until such pressure was applied as brought the line so near the extremities of the voussoirs as to cause them to turn over on their points, and rupture ensued.

Professor Moseley's proposition was very ably demonstrated, and it was argued that the formulae given by him were practically applicable, and that it was more correct to take the one point given by his formulae than to assume two points in order to find a third point, as directed in Mr. Barlow's method.

On the other hand, it was contended, that for practical utility the assumed points were preferable, as they enabled the line of pressure or thrust to be determined at one operation, instead of working through the tentative processes requisite in the application of Professor Moseley's formulae; and in this respect Mr. Barlow's rule was preferable for the practical engineer.

An arch should be viewed not as an assemblage of particles, but as a homogeneous and elastic mass, the pressure upon which extended in a greater or less degree, over the whole surface; therefore that which Mr. Barlow had designated the line of equal thrust might more properly be termed the line of neutral axis. It was argued also, that as an arch was defined to be "a system of bodies in contact, reposing ultimately upon the resisting surfaces called its abutments," an arch built of brick and

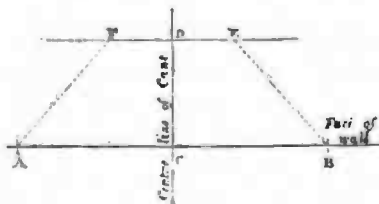
cement might be considered as a curved girder, the abutments of the former acting as the tie rods of the latter. This was met by supposing the arch reversed, the apex being downwards, when evidently fractures must ensue. The principle of tension inherent in trussed girders did not at all exist in arches, wherein the forces were pressure and resistance.

The practical consideration for arches was to adapt the form to the object for which it was intended. Thus, for a flat roadway, a very different form of arch must be used to that for a curved roadway, as in the one case the weight was not distributed over the arch, as in the other case, and the point of rupture would be in a very different position; at the crown in one case, and at the haunches in the other.

#### TO SET OUT A CANT GEOMETRICALLY.

Sir,—If you or any of your numerous correspondents would favour me with a solution of the following problem, you would greatly oblige, Sir, yours, &c., J. C. W.

Eaton-place, Jan. 26th.



To set out a cant geometrically, the width AB, the projection CD, and centre line being given, and the three sides AF, FE, and EB being required to equal each other.

#### SHORT HINTS TO THE STUDENT IN ARCHITECTURE.

"No one can grow so crooked, but it falleth out to some use."—HARRISON.

To those who have not yet passed their noviciate, the following "Hints" are principally addressed; and it is trusted that they will not be considered entirely useless upon a careful perusal by those engaged in the study of architecture as a profession, but that by their assistance the student will find himself, at the expiration of his articles, more prepared for immediate practice, a greater credit to his instructor, and greater honour to his family.

The writer cannot flatter himself that the experienced practical man will take the trouble of reading these "Hints;" if, however, any should, it is hoped that nothing will be found objectionable or widely different from the system pursued by him, and that he will not scruple at calling the attention of those he may have under his guidance, to the importance of a strict adherence to the system here but imperfectly laid down, and intended solely for the junior branches of the profession, upon the consideration that some of the experience the writer has acquired might be usefully imparted to them; premising, that to the prevention, rather than the cure of errors, these suggestions will be adopted.

It unfortunately happens, that most young men enter upon their articleship fresh and green from school, and unprepared for the profession they have determined to follow. I will not here suppose such to be your case; on the other hand, I will take it for granted, that you have long had in contemplation this as your future study, and that you have adopted it from a slight and imperfect knowledge of its principles, and that you have been pursuing a preparatory course of study to fit you for its duties; that you have acquired a tolerable knowledge of mathematics, which may be confidently termed the alphabet of architecture,—the axle upon which all its many complications depend, and without a perfect knowledge of which you can never hope to become a sound practical man. If, then, you are already versed in this important introduction to your profession, many hours of study which the unprepared student is apt to consider irksome, will be spared to you; and by having attained this preparatory knowledge, theory and practice will explain and assist each other; for the one without the other would be perfectly useless, and difficult of retention if useful; daily experience

has taught us, that practice, when unsupported by theory, reduces the practitioner to a mere machine, requiring the aid of another for motion, and deficient at each material variation of circumstances.

Frequently, an architect who has pupils in his office, does not, or cannot, pay that attention to their attendance to their office duties that so serious a charge should entail, suffering them to study or not as it pleases themselves. I need not point out to you how sad will be the results if it should unfortunately happen that you are exposed to similar neglect and pursue similar conduct; reflect seriously upon your first outset that you have a double duty to perform,—justice to yourself and to your parents, and that your time is too valuable to be wasted in frivolous pursuits or amusements; your innate sense of right and wrong will convince you of the incorrectness of such conduct, and how disastrously it must terminate to your own disadvantage. Consider that you have an equivalent to obtain for the large sum of money that has been expended to fit you for a gentlemanly profession, and to place you in your present position, and that only by a constant, diligent, and zealous attention now (without which nothing can be acquired), you can hope to obtain eventually, notice and employment; strive, therefore, diligently to make yourself useful to your teacher, and devote all the time that can be spared from necessary exercise and recreation, to the study of the profession you have embraced, and the reward for your assiduity and attention will be the confidence and esteem of your instructor, and the regard he will evince for your future well-doing.

Perhaps the most material point for consideration at your first outset, in order that you may obtain the greatest benefit from your articleship, will be the division of your time between practice and study; I would therefore recommend you to enter as early as possible into an understanding of what is going forward in the office, and while in the office direct your attention solely to the business of the office; you will lose much of the advantage you would otherwise obtain by employing your time there in reading voluminous authors on your profession, because, during such time, you must necessarily be losing the practice which it is desirable you should obtain; I therefore repeat, that while in the office, devote your time and attention chiefly to that by which you are surrounded, and bestow your leisure moments upon the various elementary works upon your profession to be found in almost every architect's office.

Do not imagine that by my dwelling so much upon the practice of architecture that the knowledge to be derived from books is to be neglected; on the contrary, in the solitude of your chamber, devote your attention to the study of some of the brilliant works of those who have handed down to their disciples the fruits of the unremitting labour of years. Pass over nothing without thoroughly comprehending it, remembering that in order to make reading beneficial and effectual, you must not only impress the mind with the subject, but that the subject, by being pondered upon, must enlarge the views of the mind generally, and produce an effect that will remain, though the mere contents of a book may be forgotten.

There is not, perhaps, any thing that receives so little of the student's attention during his articleship as the study of arithmetic, so far as it is connected with his profession, and yet there is scarcely any more important branch of his education; do not imagine that, because you are studying for the profession of an architect, it is not also requisite for you to be an arithmetician. So much of the practice of architecture depends upon a correct knowledge of numbers, that you would find yourself sadly at fault, were you to pass by this seemingly unimportant subject without giving it some portion of your time and attention. To you will probably be eventually entrusted the examination, correction, and adjustment of disputed accounts; how, then, can you fulfil the task if you are ignorant of the various, and sometimes complicated means of arriving at a correct definition; or how, I would ask, could you attempt to give an estimate of the probable cost of carrying out your designs, without a knowledge of the means by which that cost is to be determined. Devote then, to this, some portion of the time you set apart for study,